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STATE OF MONTANA

Seventh Biennial Report

OF THE

State Forester

For the Short Period December 1, 1920, to June 30, 1921,
and the Fiscal Years
1922 and 1923

TO

Honorable Joseph M. Dixon
GOVERNOR

Montana State Library



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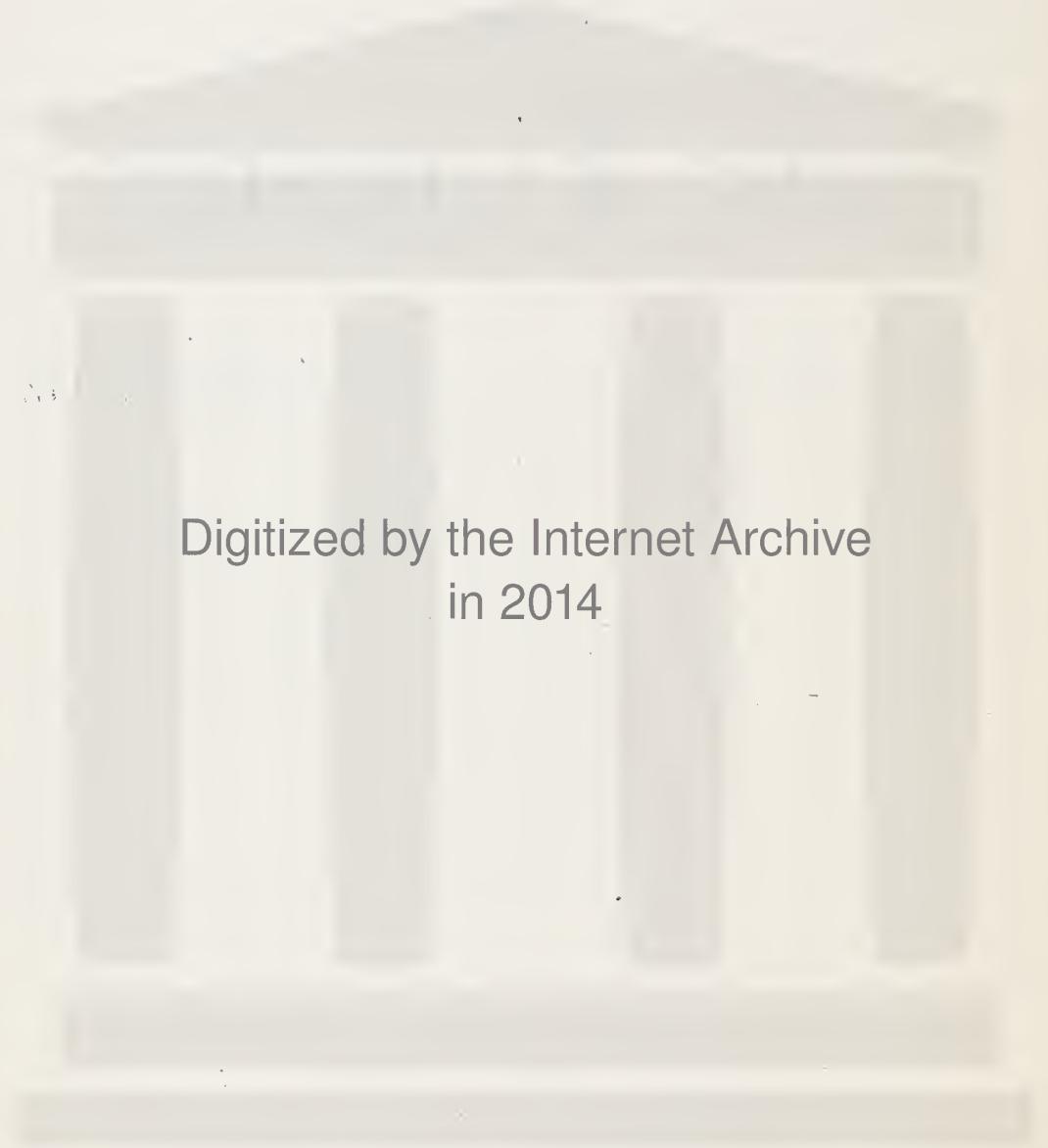
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Letter of Transmittal

Pinchot Hall of Forestry,
University of Montana,
Missoula, Montana
December 31, 1923

Honorable Joseph M. Dixon,
Governor of Montana,
Helena, Montana.

Dear Governor:

The Seventh Report of the State Forester, covering the short period between December 1, 1920, and June 30, 1921, and the biennium ending June 30, 1923, is furnished you herewith in accordance with the requirements of the law.

Yours respectfully,

R. P. McLAUGHLIN,
State Forester.



Our State Tree—The Yellow Pine

State Forests Benefit Education

The Organic Act of the territory of Montana, passed by Congress and approved May 26, 1864, provided that "sections numbered 16 and 36 in each township shall be, and the same are hereby reserved for purposes of being applied to schools in said territory" of Montana. A large number of these sections 16 and 36 occur in the forested region of the State. They are State property. In addition to these the Federal government granted the State fifty sections for legislative, executive and judicial purposes; 72 sections to the State university; 90,000 acres to the agricultural college; 100,000 acres to the school of mine; 100,000 acres to the State normal school; 50,000 acres more to the agricultural college; 50,000 acres to the State reform school; 50,000 acres to the deaf and dumb asylum; and 150,000 acres for capitol buildings.

Montana's total public land grants, then, comprise over 6,000,000 acres. There are over 4,000,000 acres left. The following is the best available information as to the location and area of the State forests:

REGION	ACREAGE
Kootenai River Drainage (Includes Wolf Creek, Libby Creek and Lower Fisher River. Scattered sections)	49,920
Coal Creek, N. F. Flathead River Drainage (Compact Unit)	18,000
Whitefish-Stillwater Drainage (Compact Unit)	89,000
Swan River Drainage (Compact Unit)	40,320
Kalispell Vicinity (South to former Flathead Indian Reservation. Scattered sections)	24,320
Clarks Fork Drainage (From Thompson River west to State line)	9,600
Thompson River Drainage (Pleasant Valley. Scattered sections)	32,000
Missoula River Drainage (Scattered sections)	65,920
Former Flathead Indian Reservation (Scattered Sections)	21,760
Bitterroot River Drainage (Compact Unit of 10,000 acres)	17,960
Big Blackfoot River Drainage (Scattered sections)	48,000
Hellgate River Drainage (South to Deer Lodge-Philipsburg. Scattered sections)	49,920
Eastern Montana	140,000
	566,720



(By Permission of U. S. Forest Service)

Our State Forests are Worth At Least \$10,000,000.

State Forests Provided for by Law

A department responsible for the management of forests worth at least \$10,000,000, from which are annually derived thousands of dollars in revenues that go to the Common School and other educational funds of the state, requires an organization well trained and well equipped.

In order to consolidate these scattered state holdings a law was passed in 1911 (Revised Statutes 1907-1908) authorizing the selection of compact forest units "to the end that the same may be controlled and managed as a State Forest." For the benefit of our public schools and other educational institutions, other compact forest units have been selected from time to time so that at present the chief State Forest units may be designated and summarized as follows:

NAME	ACREAGE	BOARD FEET OF TIMBER
Stillwater State Forest.....	89,000	700,000,000
Swan River State Forest.....	40,000	425,000,000
Coal Creek State Forest.....	18,000	170,000,000
Ross Hole State Forest.....	10,000	75,000,000
Scattered State Forest Sections.....	350,000	2,000,000,000
 Total.....		3,370,000,000

Consolidation and Extension

Around the compact units already started, the State should extend and build up the State Forests. Compact units are most susceptible of efficient and economical administration.

The scattered sections of State timber should be exchanged with private owners and the Federal government to secure compact units. Laws should be passed whereby timber-lands reverting to the State for non-payment of taxes, become either County or State Forests, to be managed by the State according to the practice of forestry.

There are about a million acres that have been burned or cut over—potential forest lands that require protection and management to keep them producing. Timber production will always be essential. Waste lands are a liability. For its own protection, therefore, the State must assume some

responsibility with respect to these timber-lands, which may otherwise become waste. The Federal government, through the United States Forest Service, will assume its share of that responsibility. Private owners must likewise assume a limited share in forest rehabilitation, to the end that all forest lands in Montana may be kept productive. The public will hereafter become the principal forest owner and producer.

In order that the State may take its proper place in this evolution as a forest owner and a forest producer, obstacles in the Enabling Act that may have prevented, have been corrected by Senate Bill 1878. The bill as passed by congress and approved February 14, 1923, reads as follows:

“That tracts of timbered lands heretofore granted to the State of Montana for educational purposes, from which the timber has been cut or removed pursuant to State laws, may, under such rules and regulations as the legislature of said State shall prescribe, be exchanged for other lands of like character and approximately of equal value, in private ownership, which exchanged land shall be subject to the same requirements and limitations to the end that the State may acquire holding in reasonably compact form and reforesting be undertaken in an economic manner, anything in the enabling act of said State to the contrary notwithstanding.”

The State Forests Permanently in State Ownership

Fortunately the Enabling Act and the State Constitution placed a minimum value upon State lands of \$10.00 per acre. When this minimum land value is applied to State forest lands, and there is added thereto the value of the timber crop, we get about this result: $\$10 + (3 \times 7) = \$10 + \$21$ or \$31.00, the value of one acre of forest land, where \$10.00 is the minimum land value, and 7000 feet per acre of timber is the average stand per acre, worth, according to law, \$3.00 per thousand feet.

The foregoing shows that State forest lands are practically out of the market. No one can afford to purchase them at that price for speculation. These provisions have held the State forests largely intact to date, except for those that have been used as base, and turned back to the Federal

government in exchange for grazing and other non-timber bearing lands in eastern Montana.

Moreover, the State forests ought not to be for sale. They should be permanently held in trust for the people of Montana, and for the benefit of Montana's public schools and other educational institutions.

State Forestry Established

The constitution of the State of Montana designates the State Board of Land Commissioners to consist of the Governor, Superintendent of Public Instruction, Secretary of State and Attorney General. This board has the control and direction of all State lands, under such regulations and restrictions as may be prescribed by law.

State Forestry was established by law in 1909, and the State forester according to law, must be skilled in the science of forestry. Under the direction of the State Board of Land Commissioners, he has general charge of all timber-lands of the State, and executes all matters pertaining to forestry within the jurisdiction of the State.

The Forestry Department considers the State forests as public property, belonging to the citizens of the State of Montana, the chief beneficiaries of which the common schools and the other educational institutions of the State. These trust estates should be managed to perpetuate the crops of timber, and maintain permanent revenues therefrom.

The forest lands should not be for sale. The timber crops on these forest lands should be sold only under such restrictions and regulations as constitute good forestry practice and management.

Policy of Montana State Forest Department

It is and should be the policy of the Montana State Forest Department to adhere closely to the following propositions:

1. Not to force its timber upon the market, but to ascertain as soon as possible the rate of growth, and conform the sales to that rate.
2. When the sale of its timber is made, to manage the timber cutting and brush disposal in a manner to leave the nucleus of a new crop upon the ground.
3. To reforest such areas of State Forests as are accidentally or unwisely denuded of their timber.

4. To encourage reforestation, and to aid in the protection of all timber lands of the State.
5. To preserve the landscape beauties of important recreational points in the State Forests.
6. To extend and consolidate the State Forests by acquisition and exchanges.

Work Started and Accomplished

Foresters often hear this: "The summer is over, the forest fires are out—what do you find to do now?" To those unfamiliar with forestry, the question is a perfectly fair one, and in the following paragraphs an effort will be made to indicate some of the work that has been started and accomplished.

SUMMARY OF WORK FOR BIENNIIUM

State forests cruised and appraised.....	25,535 acres
Timber sold and scaled, over.....	80,000,000 feet
Land examined and classified.....	77,220 acre
Slash disposal made.....	17.790 acres
Forest protection extended to cover.....	1,536,000 acres
Receipts collected	\$284,062.70
Total cost to State (appropriation expenditures	80,970.32

As early in 1921 as possible, the State Forester began an inspection of the State forests. He felt that a department responsible for the management of forests worth at least \$10,000,000, from which were derived revenues going to the common school and other educational funds of the State, required an organization well trained and well equipped.

To concentrate the work, and to bring the forests and the office into closer contact, he moved his office to Missoula, a point which is central to the forests, to lumbering and to forestry. The office is located in the Forestry Building at the University of Montana, for which no rent is paid. It was a logical move, because Missoula is the center of Montana's lumbering industry; Missoula is central to all forest protective agencies; the forestry school is located there; it is headquarters for District 1 of the United States Forest Service, and the bulk of the State forests are accessible from Missoula.

Closer inspection of all State forest activities was thus made possible. All of the State forest units were visited and practically every timber sale inspected. Among many logging operations on State forests a great deal of waste was found in logs left in the tops and butts. Waste of this kind

is a loss to the State in revenue, and an economic loss to the community. This practice was corrected, and thereafter provision made in timber sale agreements to penalize the operator if the contract requirements were not observed. Men in charge of sales were instructed to require better utilization of timber. In case of timber sales with no State forest officer in charge, men were secured and placed in charge. There was a chance that the State stood to lose its revenue on many sales for lack of a State forest officer to scale and measure the timber, and otherwise look after the State's interests. For these and several other reasons, it was necessary to employ more foresters. The revenues derived since these steps were taken is ample justification.

Further, it was found that restriction and regulation of cutting operations on sales of State timber are necessary to actual reforestation. A great part of all cutting operations on State forests had consisted of a clean cut, followed by broadcast burning, which resulted in denuding the tract of most of its forest cover. This practice had to be discontinued. The practice, however, having grown up during a period of years, is not so readily abandoned by operators, although progress in this has already been made.

Forest Appraisal

Data necessary for forest management are quite comprehensive. They pertain to age, yield, regeneration, species, types, sites, soils, values, logging layouts, etc. There was found to be a need for such information, if these forest units were to be "controlled and managed as State forests" as required by law.

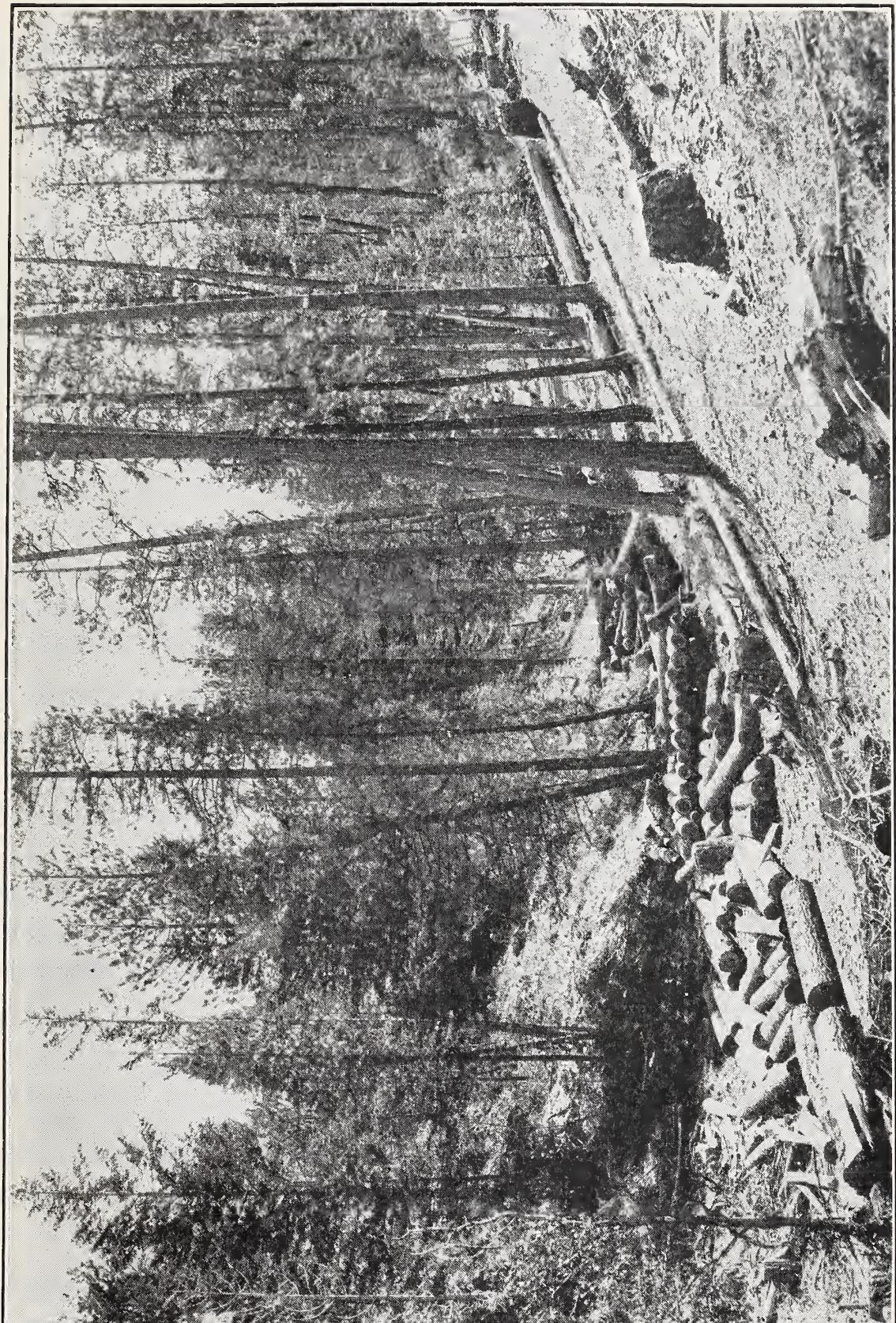
To secure this information it was necessary that the force be trained to standard methods of field work, that standard instruments be secured for use, that standard forms be devised and adopted for recording the results of their field work. These things were done. There have already been cruised and appraised by standard methods, and the results recorded on standard forms that compose permanent records of the Forester's office, 25,535 acres of State forest lands. Work and study of this kind must continue as long as forests grow. These are a guide to the current as well as future activities and management of the State forests.



A State Forest Tract

A clean cut and broadcast burn, leaving scarcely no young timber. A practice that destroys the forest cover and mars the landscape, creating a liability against the community and the State.

The manner in which timber is cut and utilized determines the revenues derived. The method of slash disposal may mean success or ruin to practical reforestation. In this instance it will cost \$10 to \$12 per acre to plant a forest. The State must wait 25 to 30 years before the forest cover can be re-established and probably another 50 years for a timber crop.



Another State Forest Tract

Harvesting the old timber and leaving the young timber to grow for a future crop is good business. The young timber is preserved. No planting is required. The forest cover is retained. The landscape is not injured. Another crop may be cut in 30 to 40 years.

"It will be infinitely cheaper and more profitable to conserve the young trees that have had a growth of 25 to 30 years, than to carry on the long and costly process of nurturing forest growth from the seedling stages." (Extract from editorial, Spokesman-Review of October 27, 1923.)

Scaling Timber

More than 80,000,000 feet B. M. of timber have been scaled during the period covered by this report. At times there have been as many as fifteen scalers employed.

Likewise this phase of timber sale administration had to be organized, standardized, and made more uniform in practice. A standard scale rule was adopted and its use enforced among all scalers. A check scaler was employed to secure uniformity and more accuracy in scaling. The use of loose cards for recording scale was discontinued. Standard forms for reporting timber cut were devised and adopted, and made effective for weekly use, thus obviating to a large extent, delinquent payments for stumpage. By use of these reports, current records of timber cut are kept in the office for each separate sale. The clerk in the office is responsible for sending out requests for payments, and keeping payments up in advance of cutting, as required by the new contract.

A standard State log mark was made up in the form of a stamping hammer. The mark therefore on all State logs is S-T. These hammers were supplied for the use of all scalers. Each log is stamped and numbered in crayon, and recorded opposite its identical number in the scale book. Check scale is then possible. The scale book becomes a permanent record of this department. Those in charge of timber scales were instructed to give attention to securing closer utilization of the timber.

Examination and Classification of Lands

To determine the exact amount of forest lands, and to segregate from the forests "lands valuable only for grazing" and "agricultural lands," examinations have been made and reports prepared, classifying 77,220 acres.

This work is a duty imposed by law upon this department. To make these examinations reliable and definite, standard methods of examination had to be adopted, forms devised, and crews trained therefor. These reports are complete in description of topography, formation, present use of land, forest or grass cover, and possibilities of best economic development; and they are accompanied by topographic and timber type maps.

Slash Disposal

The slash and debris created by logging operations consist of certain materials that constitute more or less of a menace to the surrounding forests. To eliminate this menace, the legislature in 1919 passed laws requiring that the brush, slash and other inflammable materials created by timber cuttings, be burned or otherwise disposed of. Compliance with these laws has been sporadic and spasmodic. This department, by the close of the year ending June 30, 1923, secured the disposition of old slashings on 17,790 acres. The wisdom of these slash disposal requirements has been seriously questioned. The application of the present slash disposal law is considered destructive to our young forests.

Two hundred and fifty-four permits for burning slash have been issued. Three arrests were made and two convictions secured for setting and leaving fires in violation of the State fire laws.

The method of slash disposal may mean success or ruin to practical reforestation. The public interest in the methods of slash disposal is economic. Especially is the State concerned, since a state law requires slash disposal without regard to the consequences. The practice which has grown up under this law is to burn the slashings broadcast. The result is invariably deforestation in a more or less degree. A great deal of co-operation in slash disposal has been secured, thereby enabling the State Forest Department to supervise the work, thus assuring better reforestation at reasonable costs.

The costs of this co-operative work are as follows:

SLASH DISPOSAL COSTS

	1922	1923
Slash disposal expenditures from Cooperative funds	\$514.43	\$1074.98
Law enforcement of slash disposal from Cooperative funds		130.24
Total	\$514.43	\$1205.22

Selling Crops of Timber

The receipts of this department are at present derived chiefly from sales of timber crops. The sales of live timber crops for the periods of this report amount to 82,568,131 feet B. M., for which the department collected \$279,545.25. The dead timber sold for the same periods amounts to 5,271,-809 feet B. M., for which was collected the sum of \$4,369.70. There were \$147.75 collected for forfeitures, uses, etc. The total receipts covered by this report amount to \$284,062.70.

The timber crops are disposed of free of charge to citizens in small quantities of dead, down timber, for fuel or domestic use; and by the following classes of sales:

(1) Commercial sales comprising more than 100,000 feet, which, according to law, must be advertised to secure competition of bidders.

(2) Commercial Permits A, involving not to exceed 100,000 feet, which are not advertised.

(3) Domestic Permits A that involve not to exceed 100,000 feet; not advertised, and to be used for development about the ranch, for which a charge of not less than \$1.50 per thousand feet is made.

Free Timber

Permits B may be furnished settlers and residents of the State free of charge, for small quantities of dead, down timber to be used for fuel or domestic purposes. The State Forest Department encourages the use of the material in this way, since if the material is disposed of under some regulation, it helps to keep the forests in a cleaner condition, furnishes a supply to those who need it, and effects the salvaging of material that would otherwise be wasted. The following is a tabulation of the free use made of State timber for these periods:

PERIOD	NO. PERMITS	NO. CORDS	M FT.	NO. PIECES
12-1-20 to 6-30-21.....	109	939		
7-1-21 to 6-30-22.....	199	1180		80
7-1-22 to 6-30-23.....	138	274	352	$\begin{cases} 1050 & \text{Poles} \\ 500 & \text{Posts} \end{cases}$
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Total	446	2393	352	1630

Receipts from Sales of Timber Crops

Commercial Sales Advertised:

Period	Green, B. Ft.	Receipts	Dead, B. Ft.	Receipts	Total Receipts
12-1-20 to 6-30-21.....	16,687,012	\$ 54,634.82	.....	\$.....	\$ 54,634.82
7-1-21 to 6-30-22.....	30,815,113	98,809.08	1,207,560	1,267.91	100,076.99
7-1-22 to 6-30-23.....	28,666,670	108,707.96	670,030	429.91	109,137.87
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Total.....	76,168,795	\$262,151.86	1,877,590	\$1,697.82	\$263,849.68

Commercial Permits A:						
12-1-20 to 6-30-21.....	2,517,459	\$ 7,995.71	693,900	\$ 661.20	\$ 8,656.91	
7-1-21 to 6-30-22.....	1,989,176	5,510.99	1,162,580	968.91	6,479.90	
7-1-22 to 6-30-23.....	179,250	543.50	433,500	309.25	852.75	
Total.....	4,685,885	\$ 14,050.20	2,289,980	\$1,939.36	\$ 15,989.56	
Domestic Permits A:						
12-1-20 to 6-30-21.....	392,850	\$ 723.35	193,500	\$ 164.75	\$ 888.10	
7-1-21 to 6-30-22.....	313,036	434.75	361,239	273.17	707.92	
7-1-22 to 6-30-23.....	466,785	562.73	549,500	294.60	857.33	
Total.....	1,172,671	\$ 1,720.83	1,104,239	\$ 732.52	\$ 2,453.35	
Trespass:						
12-1-20 to 6-30-23.....	570,780	\$ 1,622.36	.....	.....	.....
Total.....	82,568,131	\$279,545.25	5,271,809	\$4,369.70	\$283,914.95	
Special Use Permits:						
12-1-20 to 6-30-23.....	.....	.....	.....	.....	\$ 26.25	
Forfeitures on Advertising Timber:						
12-1-20 to 6-30-23.....	.....	.....	.....	.....	\$ 91.50	
Timber-Land Rental						
12-1-20 to 6-30-21.....	.....	.....	.....	.....	\$ 30.00	
Grand Total Receipts.....	.....	.....	.....	.....	\$284,062.70	

Receipts from Crops of State Timber for Past 14 Years

Biennial Period	Amount
1910-1912	\$ 49,567.00
1913-1914	27,378.32
1915-1916	40,017.95
1917-1918	51,062.29
1919-1920	179,836.40
1922-1923 (Including 7 mos. of 1921 to effect change in Fiscal year)	284,062.70
Total receipts from Timber crops to June 30, 1923.....	\$631,924.66

Statement of State Forestry Department Expenditures Expenditures from December 1, 1920, to June 30, 1923

PERIOD	AMOUNT
12-1-20 to 6-30-21 NO CLASSIFICATION.....	\$16,071.33
7-1-21 to 6-30-22 CLASSIFICATION	
Salaries and Wages.....	\$14,746.92
Printing	362.60
Office Supplies	321.87
Express and Drayage	20.66
Travel and Subsistence	2,661.56
Furniture and Fixtures	162.88
Legal Publications	225.00
Equipment	233.91
Postage	5.00
Bonds	13.00
Fire Protection	5,859.61
Transportation	382.33
Telephone and Telegraph	161.46
	\$25,156.80
7-1-21 to 6-30-22 PROJECT CLASSIFICATION	
Administration	\$ 6,538.11
Timber Sales	11,469.99
Forest Protection, (Fires)	17,390.04
Forest Protection, (Trespass)	89.22
Forest Management	2,984.18

Land Classification	1,124.44
Police Duties, (Preservation)	17.41
Police Duties, (Brush Disposal)	16.80
Improvements	112.00
	\$39,742.19
Total	\$80,970.32

EXPENDITURES PAST 14 YEARS

PERIOD	AMOUNT
1910	\$ 19,687.54
1911-12	16,830.66
1913-14	20,230.12
1915-16	25,732.79
1917-18	43,577.00
1919-20	94,738.01
1922-23 (With 7 mos. in 1921, due to change in Fis- cal year)	80,970.32
Total	\$301,766.44

Co-operation

Co-operation is making concrete the abstract proposition of the golden rule. Agencies working together in mutual interest with a common purpose, toward a common end for the public good, is public service exemplified. In Montana those agencies are the United States Forest Service, the private timber owners and the State Forestry Department. Their common purpose is to protect and preserve so far as practical, the timber resources of the State.

To that end the State Forester was authorized by the State Board of Land Commissioners to secure co-operation in forest protection of all the forest owners of the State.

Forest Protection of the State Extended

By agreements with the Secretary of Agriculture and the Forest Service, it was made possible under the Weeks Law to extend and intensify forest protection throughout the State.

In December, 1921, the Blackfoot Forest Protective Association of Missoula, Montana, was organized; thereby bringing under an organized system of protection 1,326,000 acres.

The Big Fork Protection Unit near Swan River was organized in 1922, and likewise brought under a system of forest protection. The acreage here is 50,000 acres. This unit is under the direct supervision of the State forest officer at Kalispell, Montana.

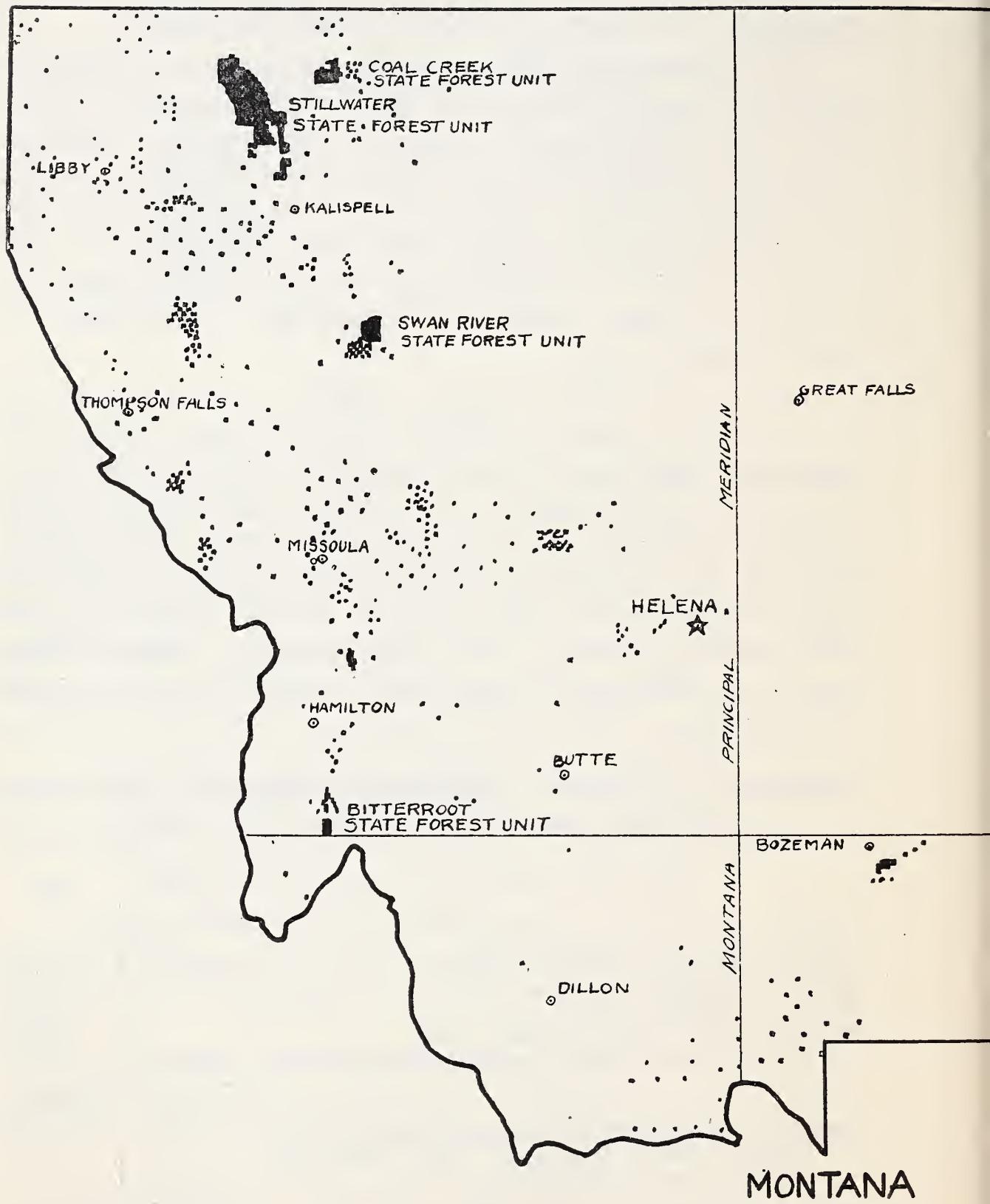
In the spring of 1922 an organization was temporarily effected to secure better forest protection in the Little Thompson River district, involving a forest region of 160,000 acres. It is hoped this may be made permanent.

The Northern Montana Forestry Association of Kalispell, Montana, began its existence in 1911. It protects over 1,000,000 acres of the forested region of northwestern Montana. The State Forests within the region covered by this association amount to about 117,000 acres. For several years past the association has protected these State Forests at a cost of not to exceed three cents per acre. The allotment of Weeks Law funds enabled the association to intensify its forest patrol.

The area of State Forests inside the National Forest boundaries, amounts to about 233,273 acres. Under an agreement with the District Forester of the United States Forest Service at Missoula, Montana, the State pays for the patrol and protection of these lands situated in eastern Montana at a rate of one-tenth of a cent per acre. In western Montana it pays for patrol only, at a rate of two and one-third cents per acre. Fire suppression in western Montana is an additional charge, and is paid for on the basis of actual cost.

Distribution of Federal Aid Supplied under the Weeks Law and State and Private Co-operative Funds

	1922	1923
Northern Montana Forestry Ass'n.	\$ 1480.00	\$ 1947.56
Blackfoot Timber Protective Ass'n.		2063.60
Big Fork Protection Unit		147.03
Thompson River and St. Regis Units		992.08
Private and State Forests outside above units....	6854.44	4857.58
	\$ 8334.44	10007.85
State aid for Fire Suppression on Cramer Creek, Chimney Creek, Dog Lake, Wolfe Creek and miscellaneous small fires	2000.00	
Total Co-operative Fund Protection Costs.....	\$10334.44	10007.85



⑥ HAVRE

GLASGOW

⑥ LEWISTON

⑥ MILESCITY

BASE

BILLINGS

LINE

ATE FORESTS

Fire Co-operation under the Weeks Law

R. N. Cunningham—Forest Service

As early as 1916, the State Forester's report pointed out the losses resulting from idle cut-over land, which was then beginning to accumulate rapidly in parts of the State. It recommended purchase of non-agricultural cut-over land by the State wherever it could be secured at a nominal price.

During the war and the period of financial retrenchment later, the State Forest Department has never been in a position to put any purchase plan into effect.

The situation with regard to fire on these lands has been improved. Whereas, a few years ago, fires were allowed to run at will over the logged-off lands, organized patrol is now provided for a large part, and losses in reproduction and young forest growth are being lessened, year by year.

This improvement has been brought about partly by increased work in this direction by the State Forest Department, partly by the increased interest in the forests of the future on the part of forest owners, large and small, and a disposition on their part to co-operate for the common good. In both State and private work, the federal Weeks Law allotment has been a factor, contributing toward the success of the protection plans.

The federal contribution then, or Weeks Law allotment, which is given for the improvement of fire protection on State and private land (none of it is to be spent for protection of government land) is a welcome addition to the State appropriation, and gives the State Forester an opportunity to improve protection throughout the State. Furthermore, it provides a basis for an understanding with private owners concerning protection of cut-over land. Thus, the State Forester can go to a timber owner or association of owners and say, "Here you have a block of cut-over land which is being ruined. It would be better for you if it were protected from fire and allowed to grow timber. It would likewise be to the advantage of Montana, and to the country as a whole. I will give you so much State and Weeks Law money, if you will provide adequate protection." This is virtually what has been done in the case of the largest two timber protective associations and they are now receiving

contributions from the State Forestry Department with the understanding that cut-over lands within the areas patrolled, will receive the same degree of protection as green timber.

The Weeks Law allotment to Montana now amounts to nearly \$14,000.00 yearly. Undoubtedly, one of the first moves in national forestry legislation will be to provide additional means for co-operating with states in fire protection. It is not unreasonable to expect that within a few years the government contribution will be equal to the State appropriation for fire protection. The law prohibits the government spending more than the State.

It seems perfectly proper that the State, the Federal government and private owners should work together to keep the forest lands of Montana permanently productive. In most discussions of plans for co-operation, it has been assumed that the cost of protecting private forest land should be divided about equally between the owner and the public agencies; that is, about 50% of the cost should be paid by the owner, and 25% each by the State and Federal governments.

The cost of adequate protection has been estimated at \$196,000 for the entire state. Theoretically, then, the owners should put up \$98,000; the State \$49,000; and the government \$49,000 for protection. During the past six years, private expenditures have ranged from \$20,000 to \$89,000, depending upon the severity of the season. The average has been \$45,000. State expenses have run from \$4,000 to \$42,220, averaging \$16,740. The Federal share has never exceeded \$13,725. Thus, to provide ideal protection, it would seem that the contribution from private owners should increase 100%, and the amount provided by the State and Federal governments, should be about trebled. As a practical proposition, probably any additional money secured from private sources should be applied to protecting green timber, while additional appropriations, by Congress or the Legislature should aim to secure better protection of cut-over land and immature timber, where without such provision the public would sustain the greatest losses.

Statement of Receipts and Disbursements Co-operative Work Fund

For the Bi-ennial Period Ending June 30, 1923

<i>Receipts</i>			
Fire Protection			
Weeks Law Fund		\$22,222.08	\$
From Private Owners		2,135.90	24,357.98
Brush Disposal			
Timber owners and purchasers			1,790.58
Emergency Fire Fund			2,177.00
Collections for Timber and trespass			2,395.01
Total Receipts			\$30,720.57
<i>Disbursements</i>			
Forest Protection		\$20,342.29	
Brush Disposal		1,719.65	
Emergency Fund, refunded to State Treasurer		2,177.00	
Timber and trespass Collections remitted to Registrar of State Lands		2,395.01	
Total Disbursements			26,633.95
Balance in Bank			4,086.62
			\$30,720.57

The above statement has been carefully checked and verified as to accuracy and proper classification, and in my opinion sets forth a true representation of funds received and disbursed for the bi-ennial period from July 1, 1921, to June 30, 1923.

E. R. Sanford,
Instructor in Accounting,
State University, Montana.

Weeks Law Allotments, 1924

July 2, 1923

Co-operative Fire Protection with States under Section 2, Weeks Law

Allotment of Federal Funds, Fiscal Year 1924
Statement A

Appropriations by States for Forestry in 1921

States Having Forestry Departments	Total	Administration, Publications, Investigations	Fire Protection	Nurseries and Reforesta- tion Work	Purchases and Maintenance of State Forests
California	\$ 398,800	\$ 21,500	\$ 49,800	\$ 27,500	\$ 300,000
Colorado	5,000	5,000	.....	.....	.....
Connecticut	24,000	6,500	12,500	.....	5,000
Idaho	50,000	.....	45,000	.....	5,000
Illinois	13,000	13,000	.....	.....	.....
Indiana	45,000	5,000	.....	10,000	30,000
Iowa	103,000	2,500	.....	500	100,000
Kansas	5,000	.....	.....	5,000	.....
Kentucky	6,000	.....	.....	6,000	.....
Louisiana	60,000	15,000	30,000	5,000	10,000
Maine	185,550	19,550	160,000	1,000	5,000
Maryland	28,580	19,080	4,950	2,150	2,400
Massachusetts	321,250	34,250	48,000	35,000	204,000
Michigan	237,609	105,000	125,000	4,042	3,567
Minnesota	159,810	10,000	134,810	10,000	5,000
Montana	35,900	11,700	24,200	.....	.....
New Hampshire	55,300	8,000	33,800	8,500	5,000
New Jersey	53,960	12,980	35,920	.....	5,060
New York	1,069,824	108,067	148,400	41,240	772,117
North Carolina	14,911	5,711	9,000	200	.....
Ohio	85,000	18,000	5,000	10,000	52,000
Oregon	42,500	11,400	31,100	.....	.....
Pennsylvania	860,000	222,500	500,000	14,120	123,380
Rhode Island	6,300	2,800	3,500	.....	.....
South Dakota	8,620	2,300	5,820	.....	500
Tennessee	17,500	6,300	10,000	1,200	.....
Texas	20,750	8,550	11,200	1,000	.....
Vermont	27,500	10,000	8,000	2,000	7,500
Virginia	16,920	6,670	10,000	250	.....
Washington	67,250	11,000	53,750	.....	2,500
West Virginia	7,000	.....	7,000	.....	.....
Wisconsin	33,600	1,800	27,800	4,000	.....
Total.....	\$4,065,434	\$704,158	\$1,534,550	\$188,702	\$1,638,024

Forestry Education in Montana

T. C. Spaulding, Professor of Forestry, University of Mont.

Montana's prosperity is dependent upon the permanence of her agricultural, forest and mining industries, particularly the first two. The forests may assist in the irrigation of our million acres of agricultural land, but they themselves cannot be irrigated. It takes the forester twice the length of time to produce a merchantable tree here that it does in more favorable regions. We must have the forest because the more favored regions cannot furnish us the indirect benefits derived from our woodland nor are the people of Montana in a mood to pay high freight bills on products we can produce in as good quality, if not in as short a length of time, here at home.

To assure its people an ample supply of wood, water and the accompanying benefits, Montana has wisely provided for a comprehensive system of forestry training, education and investigation, to go hand in hand with the actual utilization and administration of its 15,000,000 acres of timber-producing lands, particularly the 3,000,000 acres of private and state owned forest property. That this educational and investigative program might best meet the present and future demands of the people of the state, the School of Forestry at the State University was created by legislative enactment.

The creation of a School of Forestry alone was not sufficient. It was yet to determine just how, besides giving collegiate training in Forestry, it might be of maximum service to all those directly or indirectly dependent upon the State's forested land. After careful analysis of conditions, the following lines of service have been adopted:

General Program, School of Forestry, State University:

1. Cooperation, investigation and general assistance to the people of the State, and the State Forestry Department.
2. Collegiate training in Forestry, leading to a degree in Forestry or Forest Engineering.
3. A Short Course in Forestry.
4. Extension work.

To fulfill this program the University has erected one of the finest Forestry buildings in the United States. It has laboratory, classroom and library space ample for all

present and immediate future demands. Space has been provided here for the State Forester and his staff, that all the State's Forest activities may be together for economy, co-operation and mutual benefit. Missoula's advantages as a training ground for foresters are unsurpassed anywhere. It is in the heart of the State's timber wealth, over half of its lumber production is within thirty minutes ride from the Forestry building. It is the headquarters of the northern district of the Federal Forest Service, with a numerous corps of highly competent foresters, and it is in the center of the activity of the Federal, State and private forest industry of this region.

An analysis of the present and proposed lines of education and co-operation follows:

1. *Cooperation and Investigation Proposed*

Silvicultural and management studies looking toward the determination of the financial possibilities in private forest management. The solution of the woodlot and wind-break problem for the benefit of the farmers of the prairie regions of the State.

Adaptability studies of exotic trees for both park, shade and field planting.

The utilization of by-products.

2. *Collegiate Training in Forestry*

This training must be divided into two lines:

- a. General Forestry training—i. e. in the growth and management of the timber crop up to the time of harvest.
- b. Forest Engineering—i. e. in the harvesting and marketing of the forest.

Both lines of specialization have been offered in the past and will continue to be given. The field is so broad and so technical that competent training in both cannot be obtained in a four year University course. Future development in the industry will require additional lines of specialization.

3. *Short Course*

The three months Short Course given in Montana is the largest and most comprehensive of its kind in the country. Despite rigid entrance qualifications, it draws students from all over the United States. This success can be attributed only to the quality and servicability of the instruction given by the staff of the Forest School, the special lecturers from the Forest Service, and the various departments in the State organizations.

4. *Extension Work*

High School and Public School Work.

This has been limited in the past to miscellaneous lectures at vocational conferences, fire prevention campaigns and similar activities. This work must be supplemented by the preparation of data for high school course themes; outlines for high school curricula best adapted to meet the requirements of

students expecting to undertake collegiate work in Forestry; the preparation of displays for fairs and similar purposes; compilation and publication of lecture material for Women's Clubs, civic organizations, etc., and the preparation of leaflets, etc., for grade schools.

An intensive educational campaign has been carried on during Fire Prevention weeks in 1922 and 1923. Selected men from the Lumber Industry, the State's Forest Department, the Federal Forest Service or the School of Forestry, have visited practically every school in the western part of the State in an endeavor to spread the gospel of forest fire prevention and conservation of timber resources. Supplemental work was done with all organized clubs and civic bodies. Every possible means is utilized to place the forest problem before the people and to secure their co-operation in saving Montana's wealth for Montana's people.

Forest Area

Montana is the third largest state in the Union, having an area of approximately 147,380 square miles, which is about equal to 94,383,000 acres. Over one-fourth of the state is mountainous and forested. The forests are Federal owned, privately owned, and State owned. The following outline is a rough approximation of the ownership of the forests of the State:

	Acres
National Forests, Parks, Indian Reservations and Allotments, Military Reservation and Public Domain.....	17,832,000
Private	3,000,000
State of Montana	500,000
Total	21,332,000

REPORT OF MONTANA JOINT FORESTRY COMMITTEE

The following agencies subscribed to the ensuing report:

Montana Lumber Manufacturers' Association
 Northern Montana Forestry Association
 Blackfoot Forest Protective Association
 State Department of Forestry
 United States Forest Service, District No. 1
 Forest School, University of Montana

PRESENT TIMBER STAND

	M. Feet	B. M.		
	Private	State	Federal	Total
White Pine	200,000	135,000	606,000	941,000
Yellow Pine	4,000,000	322,000	5,276,000	9,598,000
Douglas Fir, Larch	8,000,000	927,000	13,060,000	21,987,000
Other (Including Lodgepole)	1,800,000	616,000	19,058,000	21,474,000
Total	14,000,000	2,000,000	38,000,000	54,000,000

PRESENT TIMBER AREA

	Acres			
	Private	State	Federal	Total
Merchantable Timber	1,959,000	247,000	6,025,000	8,231,000
Reproduction and Poles.....	224,000	70,000	2,576,000	2,870,000
Alpine or otherwise permanently non-commercial	549,000	81,000	3,385,000	4,015,000
Cut-over or burned (Devastated)	55,000	25,000	134,000	214,000
Total	2,787,000	423,000	12,120,000	15,330,000

Private State Federal Total

Additional Acreage of land so situated that it must be patrolled and protected from fire to insure the safety of the timber land	1,635,000	55,000	4,996,000	6,686,000
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RATE OF CUTTING
Feet B. M.

1900	255,685,000
1910	319,089,000
1920	410,000,000

RATE OF FIRE DESTRUCTION

	Feet B. M.	Acres
1917	185,360,000	110,693
1918	12,230,000	19,311
1919	841,394,000	441,983
1920	53,249,000	15,260
1921	22,149,000	17,373
1922	11,602,000	12,647
Average	187,644,000	102,878

TOTAL DEPLETION (Average annual)

	Feet B. M.
Cutting	400,000,000
Fire	188,000,000
Insects	72,000,000
Total	660,000,000

RATE OF GROWTH

Average period required to produce a 12-inch tree:

White Pine	.....	100 years
Yellow Pine	.....	100 years
Larch, Fir	.....	100 years
Lodgepole	.....	140 years

Average yield per acre:

	100 years	140 years
Western White Pine	12,000	18,000
Western Yellow Pine	7,000	17,000
Larch, Fir	9,000	14,000
Lodgepole	.....	6,000

The total present annual growth is estimated at 859,000,000 feet.

Carrying Costs

Present taxes on merchantable timber range from .0207 average minimum to .0493 per M ft. average maximum per annum by counties. In ten years they have advanced 91%, on an average, and seem to be advancing about 10% a year at present.

Present taxes on cut-over land, valuable chiefly for forest growing, range by counties from .0575 average minimum to .20 average maximum an acre, averaging approximately 10 cents per acre per annum. The land is assessed at from \$3.00 to \$15.00 per acre. Cut-over land taxes seem to be advancing about 10% per year.

Fire protection, not including losses, now costs private owners from $1\frac{3}{4}$ to 3 cents a year, per acre, according to location and seasonal hazard.

Fire Protection Effort

Federal forces on National Forests number about 500 regular men, who have, however, other duties than fire prevention. The regular fire force on other lands in the State is about 80 men in the normal year. Both forces employ thousands of fire fighters on occasion, also spend much on improving and equipping the protection systems. Expenditures for six years have been:

	Outside National Forests				In National Forests			
	Private	Per Cent of Total	State	Per Cent of Total	Govt. (Co-op.)	Per Cent of Total	Total	Govt.
1917	\$89,000	85	\$13,150	13	\$ 1,757	2	\$103,907	\$ 407,646
1918	21,000	75	3,968	15	2,830	10	27,816	117,613
1919	66,000	59	42,220	38	3,939	3	112,150	1,264,659
1920	27,000	66	9,814	24	4,058	10	40,872	322,188
1921	30,000	56	15,281	28	8,805	16	54,086	111,242
1922	38,000	56	16,000	24	13,725	20	67,725	69,038

Thus it will be seen that in bad fire years the forest lands which are outside the National Forests, and which include both timbered and cut-over, receive an expenditure of about \$110,000; of which 67% is private, 20% is state, and 13% is Federal. In the normal year it is about \$60,000; 50% private, 27% State, and 23% Federal. With great sectional variation this is about $1\frac{1}{2}$ cents an acre on an average.

Estimated expenditure to cover the normal year with a reasonably ideal system would be about \$196,000, averaging 4 cents an acre. Were this borne half by private owners and quarter each by State and Government, as a recognition of the latter's interest in the fast-increasing cut-over land, the former would pay \$98,000 and the two public agencies \$49,000 each. Since the latter's share would be largely fixed by advance appropriation, private owners would carry most of the excess in bad years, as at present.

In other words, the present system is about 30% adequate and its cost is 77% borne by the State and private owners. The government bears about 23% of this, which is equivalent to about 7% of the recommended ideal normal expenditure.

Lumber Production

Cut by Species M. Ft. B. M.

	1921	1922
Douglas Fir	30,887	52,472
Western Pine	100,982	136,530
Idaho W. Pine	975	351
Larch	78,849	105,845
Spruce	623	6,512
White Fir	42	20
Lodgepole Pine	1,398	588
Cottonwood	281	2,402
		17
Total all species	213,857	304,377

ACTIVE MILLS BY CLASSES

Class 0—0 to 50 M.....	39 Mills	Class 0.....	40 Mills
Class 1—50 to 499 M.....	72 Mills	Class 1.....	73 Mills
Class 2—500 to 999 M.....	12 Mills	Class 2.....	7 Mills
Class 3—1000 to 4999 M.....	9 Mills	Class 3.....	13 Mills
Class 4—5000 to 9999 M.....	3 Mills	Class 4.....	1 Mills
Class 5—10000 to and over.....	7 Mills	Class 5.....	7 Mills
 Total Mills Active.....	 142	 141 Mills (Active)	
Total Mills Idle.....	89		67 Mills (Idle)

Relation to Industry

The forests of the State are an important factor in all of the industries of the State.

Lumbering

The annual cut of the lumbering industry is approximately 400,000,000 feet board measure. This represents a business of approximately \$10,000,000 per year. It is estimated that there are fully five thousand people employed directly in the lumbering industry of the State. The chief species used in finished lumber are: white pine, yellow pine, western larch and Engelmann spruce. The chief species used in rough timbers, dimension material, ties, mining props, etc., are: western larch, Douglas fir and lodgepole pine.

Mining

The mining industry alone uses nearly one hundred million feet of the annual output of the forests. Much of the forest material used in the mines consists of rough timbers, which are used for props, lagging, stulls and the like. Formerly the smelters used a good deal of lodgepole pine, called converter poles, in connection with the smelting of the ore.

Farming and Stock Raising

There are fully a million acres of irrigated farms in Montana that depend upon the maintenance of our forests to regulate the stream flow essential for irrigation. Another million acres of potential farm lands are possible of irrigation, when irrigation projects are brought to completion. Sheep and cattle use the forest ranges of the State to a large extent, and the forest regulations are such as to encourage the use of the grasses and forage material, whenever it can be done without destruction to the seedlings and reproduction of the forests.

Power Development

The forest covered watersheds are essential to maintain and regulate the stream flow and power development. The Geological Survey in a recent statement of potential water-power resources, is quoted as follows:

“The capacity of installed plants and the potential power available 50 per cent of the time is roughly estimated for the different states as follows:

“Montana 345,040 and 3,700,000; Idaho 270,918 and 4,032,000; Wyoming 7,886 and 1,182,000; Colorado 87,978 and 1,570,000; New Mexico 1,322 and 186,000; Arizona 38,760 and 2,887,000; Utah 115,329 and 1,586,000; Nevada 13,550 and 370,000; Washington 480,356 and 7,871,000; Oregon 206,865 and 6,715,000; California 1,451,830 and 6,674,000.”

It will be seen from the foregoing sketches, that the forests of the State in their relation to our industries, are mighty important, and that only about one-fourth to one-half of the potential forest resources have been actually called into use.

Relation to Education

The State Forests' receipts go wholly to Montana's institutions. For the period of this report covering the biennium which closed June 30, 1923, the following was the distribution of State Forests' receipts derived from the sales of timber crops:

Institution	Amount
Common Schools	\$ 71,627.61
Agricultural College	19,688.62
Agricultural College Bonds	19,365.33
Deaf and Dumb Asylum	9,008.29
Capitol Buildings	111,867.63
School of Mines	21,444.25
State Normal School	28,538.37
State Reform School	1,586.34
University	936.26
 Total	 \$284,062.70

The State forests constitute, as may be seen by the foregoing, one of the best investments Montana has. They constitute an investment which is not only highly profitable but also absolutely safe. If the State forests are properly managed, the timber crops give assurance of a permanent annual income for our educational institutions.

Thirty-five per cent of the National Forests' receipts in Montana are given to the respective counties in which the National Forests are situated, for schools and roads. The following table shows what those receipts are and the counties benefited thereby:

National Forests' Receipts for Schools and Roads

	1922	1923
Beaverhead	\$ 5,472.65	\$ 5,820.87
Broadwater	690.60	1,006.09
Carbon	1,568.19	2,008.05
Carter	849.15	1,228.15
Cascade	630.76	1,190.03
Chouteau	100.37	190.28
Deer Lodge	1,138.76	1,141.46
Fergus	301.93	572.37
Flathead	1,948.51	2,248.25
Gallatin	2,728.51	4,322.77
Glacier	39.88	51.85
Golden Valley	79.66	151.02
Jefferson	2,137.17	2,818.68
Granite	966.36	1,374.43
Judith Basin	1,028.06	1,947.37
Lewis and Clark	1,830.64	2,501.70
Lincoln	12,626.43	9,830.28
Madison	6,165.42	8,887.13
Meagher	1,523.67	2,687.52
Mineral	1,034.36	3,059.71
Missoula	855.94	1,672.73
Park	2,007.48	2,732.35
Phillips	95.71	181.43
Pondera	192.13	249.85
Powder River	3,196.12	4,606.40
Powell	1,252.82	1,449.54
Ravalli	2,127.62	2,900.55
Rosebud	930.05	1,342.38

Sanders	747.21	1,498.73
Silver Bow	843.91	1,065.97
Stillwater	449.21	575.44
Sweet Grass	1,452.43	1,866.33
Teton	394.79	513.39
Wheatland	193.64	360.63
 Total	 \$57,600.14	 \$75,598.46

Forest Species of Montana

The following are Montana's forest species comprising all those in commercial and domestic use, protective covers and other kinds that are considered of inferior use and value. Those species in commercial use consist of those that are suitable for making lumber, or other products used in mining and all forms of constructive work. Those designated for domestic purposes are chiefly products in the rough secured directly from the forests and used by transients or by residents for fuel, farm and ranch improvement. Those comprising our principal protective covers are inaccessible, and by reason of altitude and climate, generally inferior in kind and quality. Other inferior kinds, scattered as individual trees or groups, are found chiefly along water courses or in situations that furnish the requisite moisture. Their uses are shelter for stock and game, refuge for birds, prevention of erosion; and in many instances they supply those transitional stages of temporary forests essential to forest replenishment.

Species Used Commercially

Western Yellow Pine	.....	Pinus ponderosa
Western White Pine	.....	Pinus monticola
Western Larch	.....	Larix occidentalis
Douglas (red) Fir	.....	Pseudotsuga taxifolia
Spruce	.....	Picea engelmanni
Lodgepole Pine	.....	{ Pinus murrayana Pinus contorta
Western Cedar	.....	Thuja plicata
White Fir	.....	Abies grandis
Cottonwood	.....	{ Populus trichocarpa Populus sargentii

While nearly all of the so-called commercial species listed above are often important as watershed cover and used for domestic purposes, yet the following list of inferior trees are perhaps used more generally for farm and ranch development, especially in the eastern part of the state where the better species are scarcer and more difficult to secure.

Inferior Species Used for Domestic Purposes

Juniper	.....	Juniperus scopulorum
Ash	.....	Fraxinus lanceolata
Birch	.....	Betula papyrifera
Alder	.....	Betula occidentalis
Aspen	.....	Alnus tenuifolia
Choke Cherry	.....	Populus tremuloides
Cottonwood	.....	Prunus demissa
Palm of Gilead	.....	Populus sargentii
Willow	.....	Populus angustifolia
		Populus acuminata
		Populus balsamifera
		Salix cordata

Species That Form the Chief Protective Covers

In Pure and Mixed Stands

White Bark Pine	.....	Pinus albicaulis
Limber Pine	.....	Pinus flexilis
Lodgepole	.....	{ Pinus murrayana Pinus contorta
Spruce	.....	Picea engelmanni
Douglas (red) Fir	.....	Pseudotsuga taxifolia
Alpine Fir	.....	Abies lasiocarpa
Mountain Larch	.....	Larix lyallii
Western Hemlock	.....	Tsuga heterophylla
Mountain Mahogany	.....	Cercocarpus ledifolius

NOTE: All names of the foregoing lists were secured from Sudworth's Check List of Forest Trees of the United States. Kirkwood's Forest Distribution in the Northern Rocky Mountains was also consulted.

Forest Types

Montana's principal forest types consist of (1) Larch-Fir; (2) Yellow Pine; (3) White Pine; (4) Spruce.

Larch-Fir Type

This type is composed of western larch (*Larix occidentalis*) and Douglas (red) fir (*pseudotsuga taxifolia*). These two species seem to be well suited for association and they grow best in northwestern Montana, where moisture is adequate—with a mean annual precipitation of not less than twenty-three inches. The larch-fir zone of Montana includes most of the Flathead River and Kootenai River drainages. As a Montana type it is therefore bounded on the north and west by the State line, on the east by the continental divide, and on the south by the Clarks Fork of the Columbia River. Several species are associated with this type, such as lodgepole pine in the drier portions, white pine, spruce, western hemlock and white fir in the moister areas.

Larch and fir are fairly prolific seeders. Reproduction on cut-over areas is invariably good if not too severely cut, and protection from destructive fires is afforded.

Some of the best stands of this type will run about 25,000 board feet per acre. The average yield per acre when cutting is restricted to a minimum diameter of 13 inches breast high, is about 9,000 board feet. The slash and debris created by logging in this type is such that considerable piling of the slash is required in order that it may be burned without destroying the young timber left.

The topography of the country in which this type predominates, ranges from flat and rolling to hilly slopes, though scarcely ever is the topography precipitous.

The character of logging in this type to date is largely winter logging—sleigh haul, and river driving to saw mills.

A conservative estimate of timber of this type in Montana, gives the present stand to be about twenty-two billion board feet.

Yellow Pine Type

Western yellow pine (*pinus ponderosa*) is the predominating species of this type. Deep in its virgin homes it is exclusively clannish. True to its highland nature its associates are few and select. Now and then a clean fir penetrates the glen or a wee, bonnie lodgepole, but a few are enuch and a muckle is too many.

The yellow pine zone extends north to about half way up Flathead Lake. It stands upon the south exposures of all the slopes of the tributaries of the Clarks Fork of the Columbia River, and extends southward to the continental divide at the head of the Bitterroot River. Its eastern limit is about the continental divide below parallel 47° north, although small forest groups of yellow pine are found even in extreme eastern Montana, especially adjacent to the Black Hills of South Dakota. The yellow pine stand of the State averages between eight and ten thousand board feet per acre. The number of 16 foot logs per tree ranges from three to six.

The merchantable stand of this species in the State is estimated at ten billion feet board measure.

White Pine Type

The white pine zone is comparatively small in Montana. The type has invaded the State from the large western white pine (*pinus monticola*) forests of Idaho. Crossing the Bitterroot mountain range on the State line it has progressed eastward, particularly in the Glacier Park region, to the very foot of the continental divide. Throughout the zone it is associated quite generally with Engelmann spruce, western larch, western hemlock, and western red cedar. The stand is seldom pure. With its associates, an acre will often yield 50,000 board feet. The number of 16 foot logs per tree ranges from four to eight. The merchantable stand of this species in Montana is about one billion feet board measure.

Spruce Type

Engelmann spruce (*picia engelmanni*) occupies the moist portions of tributary drainages in almost every part of western Montana. It grows best in places sheltered from heavy winds. It has a shallow root system and is easily wind-thrown. Virgin stands of this species in the tributaries of the Flathead River approach nearest to a true type. There conditions of soil moisture and wind shelter are ideal, affording opportunity for this species to attain its best development. In many places the stand is practically pure. In other situations it is mixed with western larch, Douglas (red) fir and white pine. In some of the best situations of this type the stand will run from 10,000 feet to 18,000 feet board measure per acre. A growth in virgin stands of 30" to 40" D. B. H., and 4 to 7, 16 foot logs per tree, is often attained. Under best conditions and site qualities, this species has produced timber 18" D. B. H. in seventy-five years.

Engelmann spruce is found in all the moister timber producing areas of Montana. Forest Products Laboratory experiments, definitely place Engelmann spruce in the list of first class pulp-woods. Probably its nearest competitor as to quality and quantity of yield is eastern white spruce (*picia canadensis*). The merchantable pulp-wood stand in the state is estimated to be twenty-five billion cords.

Lodgepole Pine (*Pinus Murrayana*)

Lodgepole pine may be regarded as nature's nurse. Forest scars wrought by fire and other forms of havoc are most frequently covered and healed by the prolific seeding qualities of this species. Possibly for this reason foresters are disinclined to regard it as a permanent forest type. This ubiquitous species reveals at least the general and common occurrence of forest fires. On burnt over areas it reproduces in dense stands, pruning itself, and crowding out its weaker brethren, as it gradually develops from dense seedling and sapling stands to pole stands, and from pole stands to more open saw timber stands, eventually permitting sufficient openings for the entrance of other species.

Virgin stands of lodgepole pine contain timber of this species 30" D. B. H. measurement, and 3 to 4, 16 foot logs per tree.

The stand per acre runs between three thousand and five thousand feet board measure. This tree is suitable for sulphite pulp. The stand in Montana is estimated at about ten billion cords.

Conclusion and Recommendations

Montana's State Forests, consisting of more than 500,000 acres, with a stand of more than three billion feet of timber, constitute an investment better than real estate bonds. It is safer than bonds of any kind, because the State has the sole power to completely regulate the property in a manner to perpetuate the forest capital and the income therefrom.

The cost of management is far below the income. The income goes wholly to Montana institutions, and chiefly benefits our schools.

Montana's opportunity to realize more fully upon these investments, and to assume its responsibility in forest production, depends upon legislation that is urgently needed.

The chief needs are:

1. A more comprehensive law for the proper and scientific management of our State Forests.
2. Exchange of lands should be authorized to permit of further consolidation of the scattered State Forest holdings.
3. Extension of the State Forests should be provided by acquiring cut-over lands suitable for forest production.
4. Protection and reforestation of all timber lands (outside National Forests) in the State should be so centralized as to come under the supervision of the State.

